Center Independent Research & Development: GSFC IRAD

Nanotechnology for Advanced Imaging and Detectors

Completed Technology Project (2011 - 2013)

Project Introduction

The goal of this IRAD is to apply nanotechnology to create new devices to enhance both the imaging and detection of light. We have demonstrated the capability to fabricate nanostructured metallic devices to create "artificial molecules" which allow interaction with electromagnetic waves in novel ways. Our goal is to design and build a protoype metamaterial device and characterize its properties for use in imaging and detector applications.

Our first objective is that of nanostructured devices for advanced light detection. Our periodic structures exhibit absorptive (nano-antenna) and reflective (magnetic mirror) resonances across the visible to near infrared wavelength range. Fabrication of these "nano-antennae" can be utilized for enhanced detection and imaging of light and the toolbox of design and fabrication tools we have developed will be applied to making proof of concept devices. Our goal will be to build a superconducting single photon counting detector. While superconducting nano wire single photon counting detectors have been built before, ours will be designed to do integral spectroscopy In our second objective; metamaterials for advanced imaging, we are in the process of completing an impedance matched and nanowire edged absorber devices for diffraction suppression. We will refine our designs based on observed performance of these types of devices with the goal of performing suppressing higher orders of the Airy pattern by apodizing the edge of our test optic. To reiterate, essentially the same periodic metallic nanowire pattern as designed and fabricated for our detector use can selectively absorb light at the edge of our device to prevent the high order "ringing" observed in the Airy pattern.

Anticipated Benefits

We have not yet evaluated the best implementation of this technology to specific funded missions.

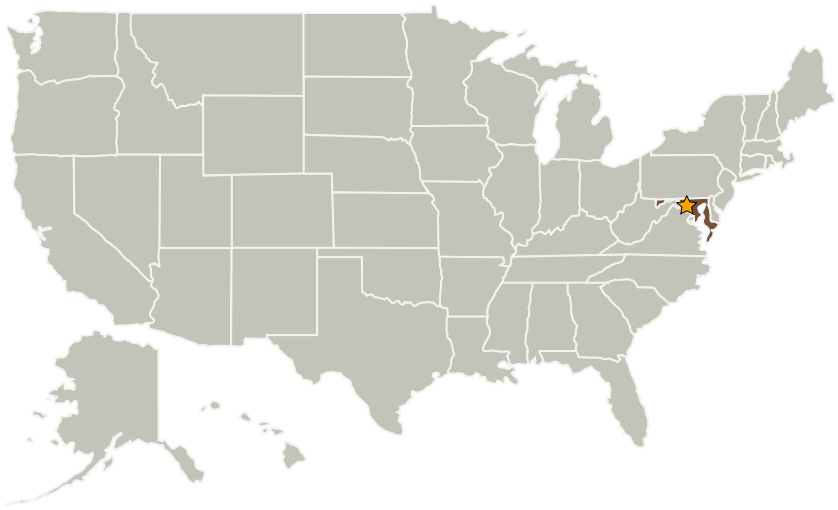
Nanotechnology for Advanced Imaging and Detectors

Table of Contents

Nanotechnology for Advanced Imaging and Detectors

Completed Technology Project (2011 - 2013)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Links

NTR 1
(no url provided)

NTR 1
(http://GSC-16671-1)

Project Website:

http://aetd.gsfc.nasa.gov/

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Manager:

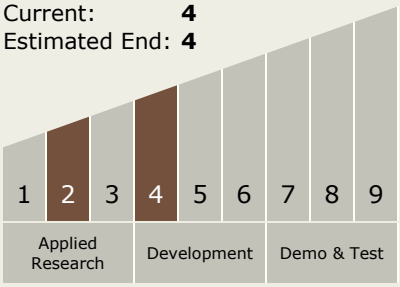
Terence A Doiron

Principal Investigator:

John G Hagopian

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Nanotechnology for Advanced Imaging and Detectors

Completed Technology Project (2011 - 2013)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components